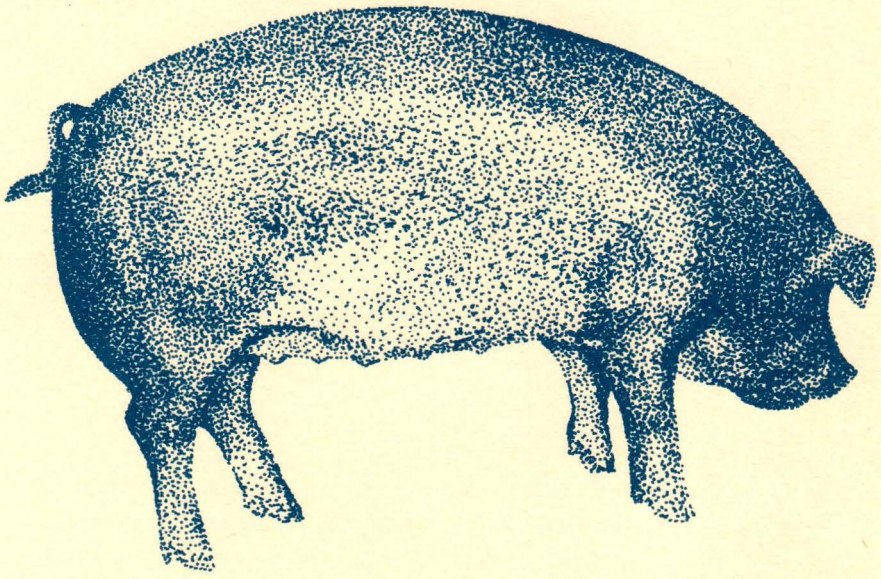
UNIVERSITY OF HAWAII COOPERATIVE EXTENSION SERVICE CIRCULAR 406



crossbreeding for commercial swine production

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CROSSBREEDING FOR COMMERCIAL SWINE PRODUCTION

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The goal of every hog producer should be to produce a quality product efficiently. Maximum swine profits can be achieved only when constructive programs are practiced in:

1. Breeding and selection,
2. Feeding,
3. Management and disease control.

Whereas an animal's heredity determines its performance potential, feeding and management practices decide how nearly this potential will be attained. Systematic crossbreeding offers commercial hog producers one method of increasing efficiency and returns.

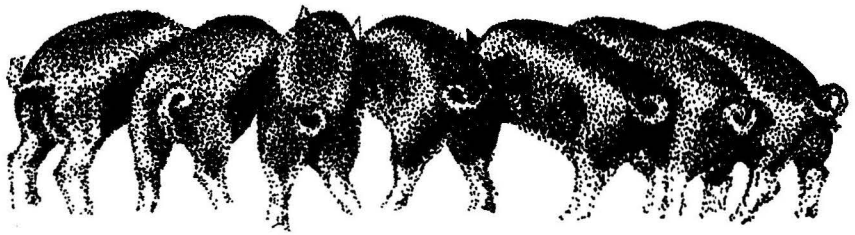
PURPOSE OF CROSSBREEDING

The chief reason for crossbreeding is to increase the vigor and performance of the resulting offspring. Crossbreeding tends to emphasize the economically important traits of the breeds used and to "cover up" less desirable traits. As a result, it is generally possible to obtain a more desirable combination of traits in crossbred animals. The superiority of the crossbred progeny above the average performance of the parents is commonly referred to as "hybrid vigor."

PERFORMANCE ADVANTAGES OF CROSSBREEDING

Not all performance traits will exhibit the same degree of hybrid vigor. Main benefits of crossbreeding in swine are:

1. **Improved Sow Productivity.** Crossbreeding advantages are increases in number of ova shed, conception rate, and litter size at birth, as well as improved milking and mothering ability of crossbred dams. When a crossing program is started using straight bred sows, maximum increase in sow productivity will not be realized in the first cross. It is by keeping and using crossbred females for further crossing that the main improvement in litter size will occur. Consequently, in starting a crossing program with straight-bred sows, it is important that the breed of sow used be inherently prolific.

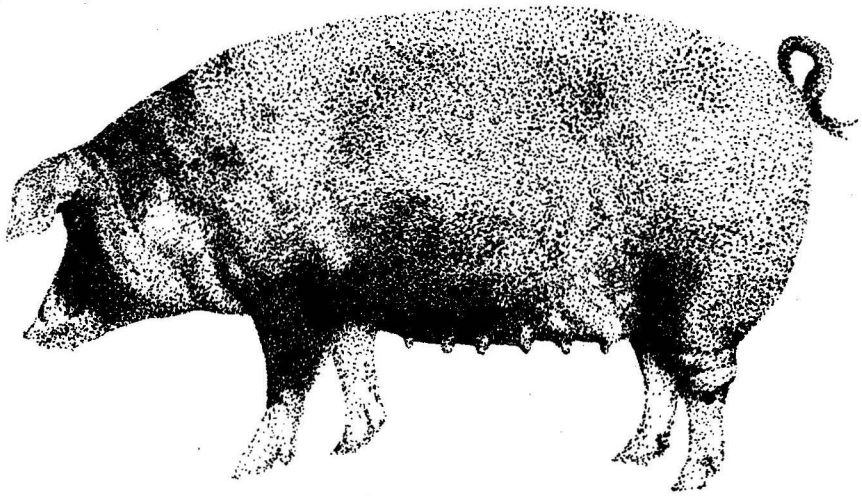


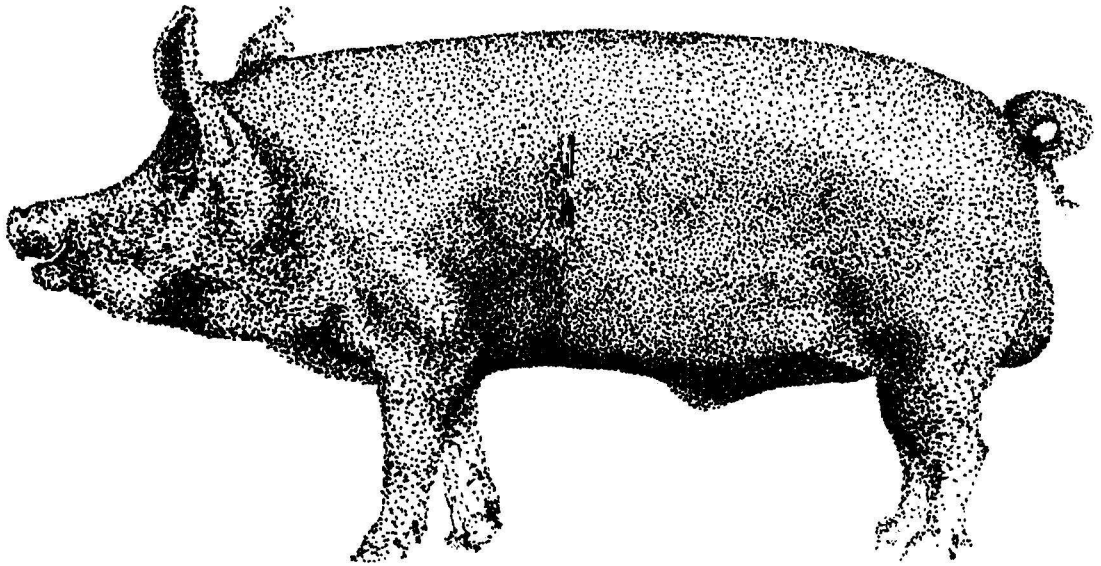
2. **Greater Survival.** Crossbred litters exhibit greater embryonic survival, greater vigor at birth, and have lower death loss after farrowing.
3. **Increased Growth Rate.** Crossbred pigs grow faster, resulting in earlier marketing.

Carcass quality will not improve greatly simply by crossbreeding. If the crossbred animals are to be of desirable meat type, the parent stocks used must possess the potential for good carcass quality. However, crossbreeding does allow the producer to incorporate into his breeding program those breeds that do evidence more desirable carcass traits.

Trait	Relative degree of hybrid vigor*
Sow performance	
Pig survival	
Growth Rate	
Efficiency of Gain	
Overall carcass merit	

*The longer the line, the greater the relative amount of hybrid vigor.





FACTORS TO CONSIDER IN A CROSSBREEDING PROGRAM

1. Breeds to Use.

No breed has a monopoly on all desirable performance traits. Some breeds are strong in certain traits, whereas other breeds are inherently superior in other traits. In crossbreeding for commercial hog production, the value of any breed rests primarily on its contribution to the overall breeding program.

Breeds of European origin, such as the Landrace, Yorkshire, and Tamworth, have advantages in litter size, mothering ability, and carcass length. The Tamworth, however, is slower-gaining and lacks meatiness in the carcass.

Breeds of American origin—Hampshire, Duroc, Poland China, etc.—are usually more rugged and less susceptible to respiratory problems, and they generally do better under less favorable management and housing conditions. Meatiness of carcass is obtained in breeds such as Hampshire, Poland China, and Berkshire. Fast growth rate is characteristic of the Duroc breed. Less desirable performance features are the poorer litter size and mothering ability of the Berkshire and Poland China breeds and less favorable carcass (tendency to overfat and smaller loin eye) of the Duroc and Chester White breeds.

A commercial hog producer should be familiar with the performance characteristics of breeding stock available. With this knowledge, he can select and cross breeds that complement one another in desired traits.

2. Number of Breeds to Use.

Results indicate the most benefit from crossbreeding is obtained by using three or four breeds. The exact number of breeds to use is determined by the availability of quality breeding stock.

3. Genetic Diversity.

The more unrelated the crossing breeds are in their genetic background, the greater will be the increased performance of the offspring. The makeup of the sow herd serves as a guide in determining the breed of boar to be used.

4. Selection of Breeding Stock.

Maximum benefits from crossbreeding is obtained only by careful selection and use of performance-tested breeding stock.

The genetic merit of the boars used is essential to a successful crossbreeding program. Boars should be selected or purchased on the basis of superior records for the economically important traits—growth rate, feed efficiency, and carcass quality, as well as for desirable conformation.

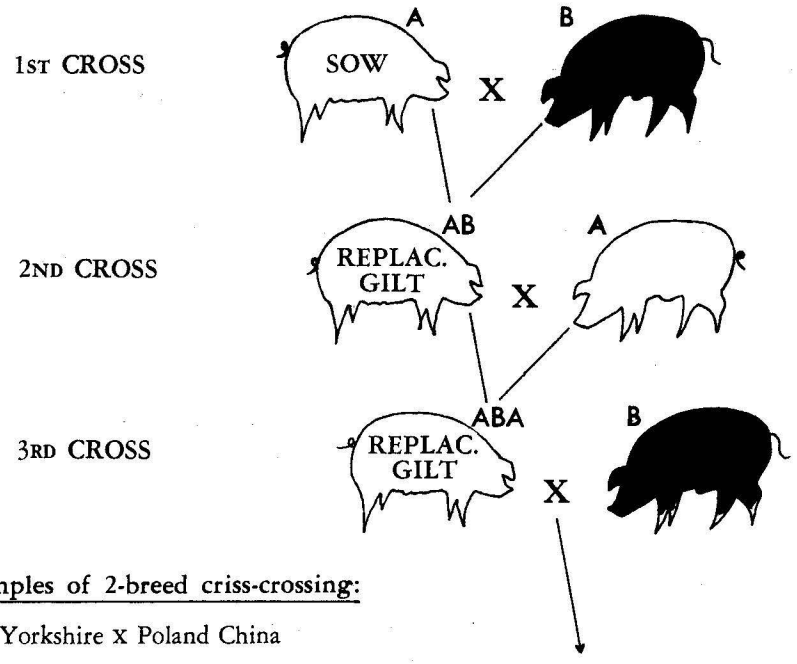
Replacement gilts retained from the herd should be selected on the basis of dam productivity, growth rate, backfat probe, and desirable conformation.

CROSSBREEDING SYSTEMS

A crossing program should be planned, systematic. It should be kept simple. Two continual crossing programs are available to commercial swine producers:

1. **Criss-Cross.**

This program uses two breeds alternately and is recommended where good individuals of only two breeds are available. Using boars of two breeds, the criss-crossing program is continued by mating replacement gilts in each generation to a new boar of the other breed. Initially, two breeds (A and B) are crossed. Replacement gilts are saved from this cross and bred to a new boar of one of the parent breeds (A). Consequently, pigs from this cross would be ¾ A and ¼ B. Replacement gilts are saved from this cross and bred to a boar from breed B. This criss-crossing may be illustrated as follows:



Examples of 2-breed criss-crossing:

Yorkshire x Poland China

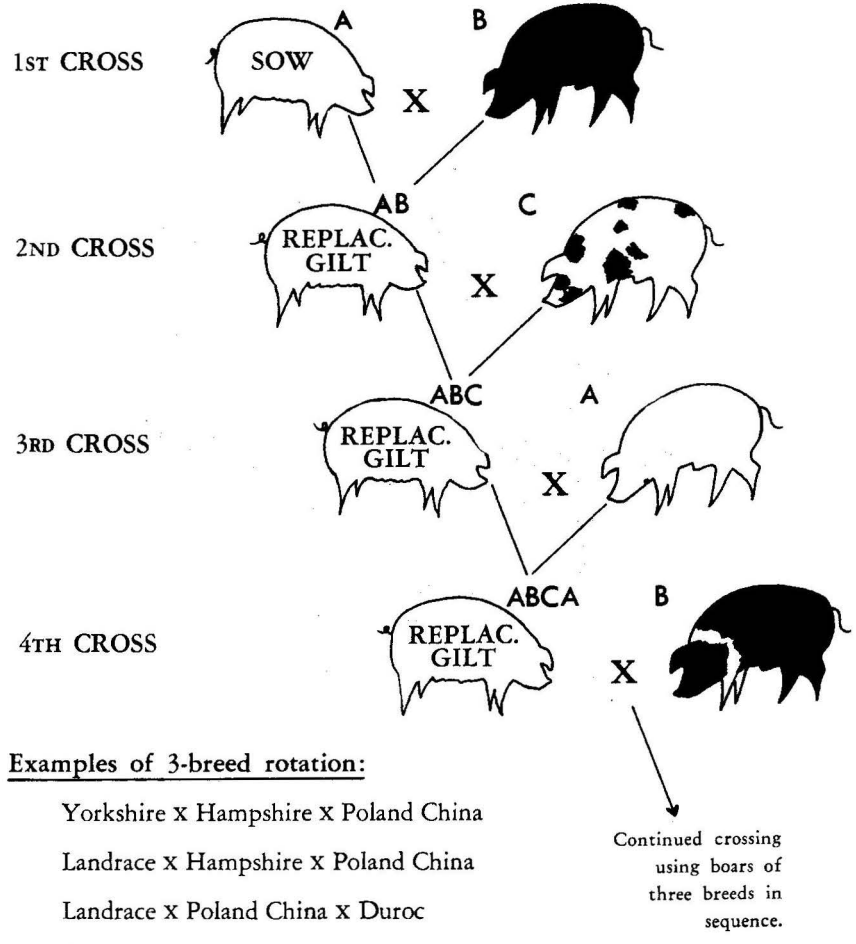
Yorkshire x Hampshire

Landrace x Poland China

Landrace x Hampshire

2. Rotation.

Rotational crossing uses 3 (or 4) breeds. The use of boars from three breeds in sequence results in better overall results as compared with a criss-crossing program. Breeds A and B are crossed to begin the program. Replacement gilts saved from this mating are bred to a boar from a third breed C. Replacement gilts from this mating would be retained and mated to a boar from one of the original parental breeds (A) and the cycle would be continued. This system is shown as follows:



Examples of 3-breed rotation:

Yorkshire x Hampshire x Poland China

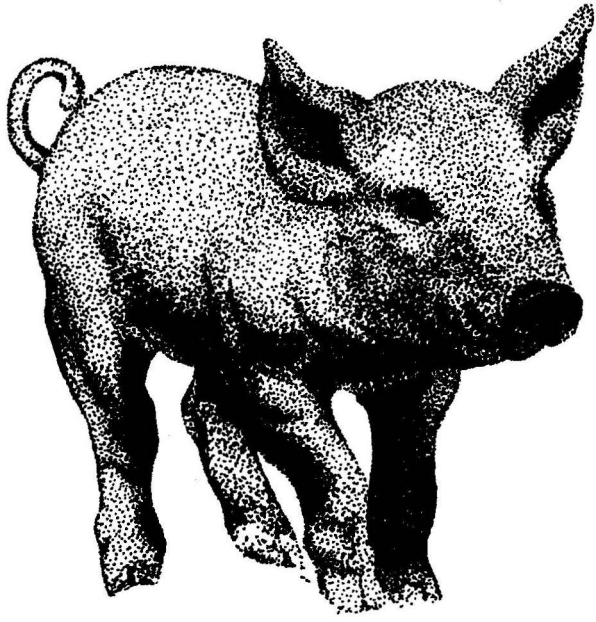
Landrace x Hampshire x Poland China

Landrace x Poland China x Duroc

Yorkshire x Duroc x Hampshire

Both the criss-cross and rotational systems have the advantage of using crossbred sows, resulting in greater sow productivity. Crossbred replacement females are produced each generation. All that is necessary to keep the program going is to obtain boars of the particular breed required. In starting a crossing program with crossbred sows, the predominant breed makeup of the sow herd will determine the initial breed of boar to use.

As long as effective selection of boars and female breeding stock is maintained, a crossbreeding program can be carried on indefinitely.



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